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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/532,852

12/14/2005

Tsuneo Maki

2271/74323

1932

23432 7590 04/23/2008
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EXAMINER

BLACKSHIRE, DAVID A

ART UNIT

PAPER NUMBER

2852

MAIL DATE

DELIVERY MODE

04/23/2008

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.		Applicant(s)	
	10/532,852		MAKI ET AL.	
	Examiner		Art Unit	
	DAVID A. BLACKSHIRE		2852	

– The MAILING DATE of this communication appears on the cover sheet with the correspondence address –

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 14 December 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-28 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-11, 13-23 and 25-28 is/are rejected.
- 7) ☒ Claim(s) 12, 24 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 27 April 2005 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>4/27/2005</u> | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Drawings

1. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they include the following reference character(s) not mentioned in the description: "106", as seen in Figs. 3, 4, 5A, 6, 10, 11B, and 14; "207", as seen in Fig. 1; "85" and "86", as seen in Fig. 5B; and "131", as seen in Fig. 11A and 12B. Corrected drawing sheets in compliance with 37 CFR 1.121(d), or amendment to the specification to add the reference character(s) in the description in compliance with 37 CFR 1.121(b) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

2. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they do not include the following reference sign(s) mentioned in the description: "1211", as seen in par. 0081, lines 2, "rotational member 1211". Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the

sheet, even if only one figure is being amended. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Specification

3. The disclosure is objected to because of the following informalities:
4. In par. 0055, line 1, the phrase, "intermediate transfer part 110", should instead read, "intermediate transfer part 100".
5. In par. 0057, lines 3-4, the phrase, "clearances 111 and 114", should instead read, "clearances l_{11} and l_{14} ".
6. In par. 0088, line 8, the phrase, "an amount of engagement 122", should instead read, "an amount of engagement l_{22} ".

Appropriate correction is required.

Claim Objections

7. Claim 15 is objected to because of the following informalities: Claim 15 recites the limitation "the drive roller" in line 2. There is insufficient antecedent basis for this limitation in the claim. The Examiner believes that the Applicant intended to positively recite "a drive roller", as was claimed in claim 1. Appropriate correction is required.

Claim Rejections - 35 USC § 102

8. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

9. Claims 1-3, 14-17 and 28 are rejected under 35 U.S.C. 102(b) as being anticipated by Kurokawa et al. (US 5873016).

10. Regarding claim 1, Kurokawa et al. disclose a belt conveyance apparatus comprising: a drive roller [36] [Fig. 2]; a driven roller [59] [Fig. 1A] rotating in accordance with an operation of the drive roller [36]; a conveyance belt [35] [Fig. 2] engaged with the drive roller [36] for rotationally driving the conveyance belt [35] and the driven roller [59], the conveyance belt [35] being provided with a bead [65'] [Fig. 4B] formed on an inner side thereof; and driven roller support means [64] [Fig. 1A] for movably supporting the driven roller [59] in a thrust direction, wherein, in operation, ends of the drive roller [36] and the driven roller [59] interface with the bead [65'] of the conveyance belt [35] so as to restrict a deflection of the conveyance belt [35] in the thrust direction, and the driven roller [59] is movable in the thrust direction against a deflection of the conveyance belt [35].

11. Regarding claim 2, Kurokawa et al. disclose the belt conveyance apparatus as claimed in claim 1, wherein the bead [65'] is formed on each side of the conveyance belt [35] in a direction of width thereof, and a clearance between a first end of the driven roller [59] and the driven roller support means [64] on a side of the first end of the driven

roller [59] is greater than a sum of a first clearance between a second end of the driven roller [59] and the bead [65'] located on a side of the second end of the driven roller [59], a second clearance between a first end of the drive roller [36] and the bead [65'] on a side of the first end of the drive roller [36], and a third clearance between a second end of the drive roller [36] and the bead [65'] [In the invention of Kurokawa et al., there is negligible clearance between the bead on a particular end and the respective end of the rollers, thus the sum of all three measures is also negligible and less than the clearance between the first end of the driven roller and the driven roller support means].

12. Regarding claim 3, Kurokawa et al. disclose the belt conveyance apparatus as claimed in claim 1, wherein the bead [65'] is provided on an inner side of the conveyance belt [35], and a groove is formed on a circumferential surface of the drive roller so that the bead is brought into engagement with the groove [See Fig. 1A].

13. Regarding claim 14, Kurokawa et al. disclose the belt conveyance apparatus as claimed in claim 1, further comprising pressing means [12] for pressing the conveyance belt to the drive roller [36], wherein the pressing means [12] is located at a position opposite to the drive roller [36] with the conveyance belt [35] interposed therebetween [col. 2, lines 49-53].

14. Regarding claim 15, Kurokawa et al. disclose an image forming apparatus comprising: image forming means for forming an image; and a belt conveyance apparatus including: a drive roller [36] [Fig. 2]; a driven roller [59] [Fig. 1A] rotating in accordance with an operation of the drive roller [36]; a conveyance belt [35] [Fig. 2] engaged with the drive roller [36] for rotationally driving the conveyance belt [35] and

the driven roller [59], the conveyance belt [35] being provided with a bead [65'] [Fig. 4B] formed on an inner side thereof; and driven roller support means [64] [Fig. 1A] for movably supporting the driven roller [59] in a thrust direction, wherein, in operation, ends of the drive roller [36] and the driven roller [59] interface with the bead [65'] of the conveyance belt [35] so as to restrict a deflection of the conveyance belt [35] in the thrust direction, and the driven roller [59] is movable in the thrust direction against a deflection of the conveyance belt [35].

15. Regarding claim 16, Kurokawa et al. disclose the image forming apparatus of claim 15, wherein the bead [65'] is formed on each side of the conveyance belt [35] in a direction of width thereof, and a clearance between a first end of the driven roller [59] and the driven roller support means [64] on a side of the first end of the driven roller [59] is greater than a sum of a first clearance between a second end of the driven roller [59] and the bead [65'] located on a side of the second end of the driven roller [59], a second clearance between a first end of the drive roller [36] and the bead [65'] on a side of the first end of the drive roller [36], and a third clearance between a second end of the drive roller [36] and the bead [65'] [In the invention of Kurokawa et al., there is negligible clearance between the bead on a particular end and the respective end of the rollers, thus the sum of all three measures is also negligible and less than the clearance between the first end of the driven roller and the driven roller support means].

16. Regarding claim 17, Kurokawa et al. disclose the image forming apparatus as claimed in claim 15, wherein the bead [65'] is provided on an inner side of the

Art Unit: 2852

conveyance belt [35], and a groove is formed on a circumferential surface of the drive roller so that the bead is brought into engagement with the groove [See Fig. 1A].

17. Regarding claim 28, Kurokawa et al. disclose the image forming apparatus of claim 15, further comprising pressing means [12] for pressing the conveyance belt to the drive roller [36], wherein the pressing means [12] is located at a position opposite to the drive roller [36] with the conveyance belt [35] interposed therebetween [col. 2, lines 49-53].

Claim Rejections - 35 USC § 103

18. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

19. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

20. Claims 4, 5, 18, and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kurokawa et al. (US 5873016) in view of Ohata et al. (JP2002193471).

21. Regarding claim 4, Kurokawa et al. disclose the belt conveyance apparatus as claimed in claim 1.
22. Regarding claim 5, Kurokawa et al. disclose the belt conveyance apparatus as claimed in claim 4, wherein a taper is formed on an end surface of the drive roller [36] so that, in an unoperated state, a non-tapered portion of the end surface overlaps a side surface of the bead [65'] [See fig. 1B].
23. Regarding claim 18, Kurokawa et al. disclose the image forming apparatus of claim 15.
24. Regarding claim 19, Kurokawa et al. disclose the image forming apparatus of claim 18, wherein a taper is formed on an end surface of the drive roller [36] so that, in an unoperated state, a non-tapered portion of the end surface overlaps a side surface of the bead [65'] [See fig. 1B].
25. Kurokawa et al. differ from the instant invention by not disclosing "wherein coefficient of friction between an end portion of the drive roller and the bead is set smaller than a coefficient of friction of a center portion of the drive roller and the bead", as set forth in claims 4 and 18.
26. Ohata et al. teach a belt conveyance apparatus, wherein the coefficient of friction between an end portion of a drive roller and a bead is set smaller than a coefficient of friction of a center portion of drive roller and the bead [see Figs. 7a and 7b, see also machine translation, par. 0036].
27. It would have been obvious to one of ordinary skill in the art at the time the invention was made to have including the teachings of Ohata et al. in the apparatus of

Kurokawa et al. in order to keep frictional shearing stress low [Ohata et al., machine translation, par. 0036, lines 2-3].

28. Claims 6 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kurokawa et al. (US 5873016) in view of Ohata et al. (JP2002193471) further in view of Kawaishi et al. (JP05306037).

29. Regarding claim 6, Kurokawa et al. and Ohata et al. teach the belt conveyance apparatus as claimed in claim 5.

30. Regarding claim 20, Kurokawa et al. and Ohata et al. teach the image forming apparatus as claimed in claim 19.

31. Kurokawa et al. differ from the instant invention by not disclosing wherein an outer diameter of a second rotational member is within a range of 1.0 mm of an outer diameter of a first rotational member, as set forth in claims 6 and 19.

32. Kawaishi et al. teach a belt conveyance apparatus, comprising a first rotational member constituting the center portion of the drive roller and a second rotational member constituting the end portion of the drive roller [See Fig. 3], wherein an outer diameter of the second rotational member is within a range of 1.0 mm of an outer diameter of the first rotational member [Machine Translation, par. 0048, lines 14-18].

33. It would have been obvious to one of ordinary skill in the art at the time the invention was made to have included to optimal range of Kawaishi et al. in the apparatus of Kurokawa et al. in order to prevent weakening of contact pressure [Kawaishi et al., Machine Translation, par. 0048, lines 14-17].

34. Claims 7 and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kurokawa et al. (US 5873016) in view of Ohata et al. (JP2002193471) further in view of Maki (JP04169440).

35. Regarding claim 7, Kurokawa et al. and Ohata et al. teach the belt conveyance apparatus as claimed in claim 5.

36. Regarding claim 21, Kurokawa et al. and Ohata et al. teach the belt conveyance apparatus as claimed in claim 19.

37. Kurokawa et al. differ from the instant invention by not disclosing wherein a "taper angle of the taper with respect to the end surface of the drive roller is set in a range from 10 degrees to 45 degrees", as set forth in claims 7 and 21.

38. Maki et al. teach a belt conveyance apparatus wherein a taper angle of a taper with respect to the end surface of a roller is set in a range from 10 degrees to 45 degrees [See Figs. 1 and 3a].

39. It would have been obvious to one of ordinary skill in the art at the time the invention was made to have included the taper angle of Maki et al. in the apparatus of Kurokawa et al. in order to prevent the bead from being easily displaced from the belt [Maki, English Abstract, lines 18-19].

40. Claims 8-10, and 22-24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kurokawa et al. (US 5873016) in view of Hayakawa et al. (JP2002060085).

41. Regarding claim 8, Kurokawa et al. disclose the belt conveyance apparatus as claimed in claim 1, wherein an axis of the drive roller and an axis of the driven roller are substantially perpendicular to a direction of conveyance of a paper sheet.

42. Regarding claim 9, Kurokawa et al. disclose the belt conveyance apparatus as claimed in claim 8, wherein the bead is formed on one side of an inner surface of the conveyance belt so that, in an operated stated, the bead interferes with a lower one of opposite ends of the driven roller in operation [As seen in Fig. 1A, the bead 65 is formed on both sides, thus satisfying the limitation of being formed on one side].

43. Regarding claim 10, Kurokawa et al. disclose the belt conveyance apparatus as claimed in claim 9, wherein a taper is formed on an end surface of the drive roller [36] so that, in an unoperated state, a non-tapered portion of the end surface overlaps a side surface of the bead [65'] [See fig. 1B].

44. Regarding claim 22, Kurokawa et al. disclose the image forming apparatus as claimed in claim 15, wherein an axis of the drive roller and an axis of the driven roller are substantially perpendicular to a direction of conveyance of a paper sheet.

45. Regarding claim 23, Kurokawa et al. disclose the image forming apparatus as claimed in claim 22, wherein the bead is formed on one side of an inner surface of the conveyance belt so that, in an operated stated, the bead interferes with a lower one of opposite ends of the driven roller in operation [As seen in Fig. 1A, the bead 65 is formed on both sides, thus satisfying the limitation of being formed on one side].

46. Regarding claim 24, Kurokawa et al. disclose image forming apparatus as claimed in claim 23, wherein a taper is formed on an end surface of the drive roller [36]

so that, in an unoperated state, a non-tapered portion of the end surface overlaps a side surface of the bead [65'] [See fig. 1B].

47. Kurokawa et al. differ from the instant invention by not disclosing that the axis of the driven roller is inclined with respect to the axis of the drive roller, as set forth in claims 8 and 22.

48. Hayakawa et al. teach the axis of a driven roller [61] that is inclined with respect to the axis of a drive roller [62] [Figs. 3, 4a and 4b] [English Abstract, lines 8-19].

49. It would have been obvious to one of ordinary skill in the art at the time the invention was made to have included the teachings of Hayakawa et al. in the apparatus of Kurokawa et al. in order to eliminate looseness and wrinkles on the transfer surface [Hayakawa et al., English Abstract, lines 26-28].

50. Claims 11 and 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kurokawa et al. (US5873016) in view of Hayakawa et al. (JP2002060085) further in view of Maki (JP04169440).

51. Regarding claim 11, Kurokawa et al. disclose the belt conveyance apparatus as claimed in claim 10.

52. Regarding claim 25, Kurokawa et al. disclose the image forming apparatus as claimed in claim 24.

53. Kurokawa et al. differ from the instant invention by not disclosing wherein a "taper angle of the taper with respect to the end surface of the drive roller is set in a range from 10 degrees to 45 degrees", as set forth in claims 11 and 25.

54. Maki et al. teach a belt conveyance apparatus wherein a taper angle of a taper with respect to the end surface of a roller is set in a range from 10 degrees to 45 degrees [See Figs. 1 and 3a].

55. It would have been obvious to one of ordinary skill in the art at the time the invention was made to have included the taper angle of Maki et al. in the apparatus of Kurokawa et al. in order to prevent the bead from being easily displaced from the belt [Maki, English Abstract, lines 18-19].

56. Claims 13 and 27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kurokawa et al. (US5873016) in view of Omata et al. (US2002/0110392).

57. Regarding claim 13, Kurokawa et al. disclose the belt conveyance apparatus of claim 1.

58. Regarding claim 27, Kurokawa et al. disclose the image forming apparatus of claim 15.

59. Kurokawa et al. differ from the instant invention by not disclosing "wherein a coefficient of friction between the drive roller and the conveyance belt is greater than a coefficient of friction between the driven roller and the conveyance belt", as set forth in claims 13 and 27.

60. Omata et al. teach a belt conveyance apparatus wherein a coefficient of friction between a drive roller and a conveyance belt is greater than a coefficient of friction between a driven roller and the conveyance belt [par. 0014; "the surface of the driven roller has a layer whose coefficient of friction is lower than that of the surface of the driving roller"].

61. It would have been obvious to one of ordinary skill in the art at the time the invention was made to have included the teachings of Omata et al. in the apparatus of Kurokawa et al. in order to "prevent generation of a local convex portion as a result of adhesion to foreign matter, such as scattered toner, to the rollers between which the transferring material carrying belt or the intermediate transferring belt is wound and stretched, thereby preventing staining of the rear surface of the transfer material due to cleaning defect of the belt, transfer defect, etc." [Omata et al. par. 0013].

Allowable Subject Matter

62. Claims 12 and 26 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

63. The following is a statement of reasons for the indication of allowable subject matter: The prior art does not disclose or suggest the claimed, "wherein a frictional force in the thrust direction between the driven roller support means and the driven roller is smaller than a frictional force of the driven roller and the conveyance belt", in combination with the remaining claim elements, as set forth in claims 12 and 26.

64.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to DAVID A. BLACKSHIRE whose telephone number is (571)272-1392. The examiner can normally be reached on Monday through Friday, from 9:00 AM-5:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Gray can be reached on (571) 272-2119. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/David M Gray/
Supervisory Patent Examiner, Art Unit 2852

DAB
/David A Blackshire/
Examiner, Art Unit 2852

10/532852

JC20 Rec'd PCT/PTO 27 APR 2005

Dkt. 2271/74323

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application of: Tsuneo MAKI, Tomiyoshi MISUMI, Kiyoshi TSUKAMURA, Yohichi ITOH and Hideo AOKI

Serial No. : Not Yet Known Int'l Appl'n No.: PCT/JP2004/013865

Date Filed : Concurrently Herewith Int'l Filing Date: 15 September 2004

For: BELT CONVEYANCE APPARATUS AND IMAGE FORMING APPARATUS USING SUCH A BELT CONVEYANCE APPARATUS

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New York, N.Y. 10036
(212) 278-0400

Mail Stop PCT
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450
ATTN: DO/EO/US

Sir:

INFORMATION DISCLOSURE STATEMENT

Pursuant to the applicant's duty of disclosure, the information listed in the attached Form PTO-1449 is brought to the attention of the Examiner.

It is respectfully requested that the information cited in annexed Form PTO-1449 be considered by the Examiner in connection with the above-identified patent application, filed concurrently herewith, and that such art be made of record in said application.

The subject application is a U.S. national phase application under 35 U.S.C. 371 of International Application No. PCT/JP2005/013865. Some of the items listed on the annexed Form PTO-1449 were cited in the International Search Report and/or Written Opinion in connection with International Application No. PCT/JP2005/013865. Copies of the International Search Report and/or Written Opinion are submitted concurrently herewith.

The citation of the listed items is not a representation that they constitute a complete or

Application of: Tsuneo MAKI et al.
Filed: Concurrently Herewith
Page 2

Dkt. 2271/74323

exhaustive listing of the relevant art or that these items are prior art. The items listed are submitted in good faith, but are not intended to substitute for the Examiner's search. It is hoped, however, that in addition to apprising the Examiner of the particular items, they will assist in identifying fields of search and in making as full and complete a search as possible.

The filing of this Information Disclosure Statement is not an admission that the information cited herein is, or is considered to be, material to patentability as defined in 37 C.F.R. §1.56(b).


According to the August 5, 2003 OG Notice published by the Patent and Trademark Office, the Office has waived the requirement under 37 C.F.R. §1.98(a)(2)(i) for submitting a copy of each cited U.S. patent and each cited U.S. patent application publication for all U.S. national patent applications filed after June 30, 2003 and for all international application that have entered the national stage under 35 U.S.C. §371 after June 30, 2003.

Accordingly, copies are submitted herewith for only references listed on the annexed Form PTO-1449 that are not a U.S. patent or U.S. patent application publication.

The Office is hereby authorized to charge any fees which may be required for consideration of this Information Disclosure Statement and to credit any overpayment to our Deposit Account No. 03-3125.

Respectfully submitted,

Date: April 27, 2005



Paul Teng, Reg. No. 40,837
Attorney for Applicants
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JC20 Rec'd PCT/ 27 APR 2005

Sheet 1 of 1

Form PTO-1449	U.S. Department of Commerce Patent and Trademark Office	Atty. Docket No. 2271/74323	10/532852 Not Yet Known
INFORMATION DISCLOSURE CITATION (Use several sheets if necessary)		Applicants: Tsuneo MAKI et al.	
		Filing Date: Herewith	Group Art Unit: 2852

U.S. PATENT DOCUMENTS

Examiner Initial	Document Number	Date	Name	Class	Subclass	Filing Date if Appropriate
/DB/	5 6 1 5 0 0 0	3-25-1997	Ueda et al.			

FOREIGN PATENT DOCUMENTS

	Document Number	Date	Country	Class	Subclass	Translation
						Yes No
/DB/	JP 5 9 - 1 1 8 3 8	1-25-1984	Japan			
	JP 6 4 - 4 8 4 5 7	3-24-1989	Japan			
	JP 3 - 7 3 5 4 1	7-24-1991	Japan			
	JP 4 - 1 6 9 4 4 0	6-17-1992	Japan			Abstract
	JP 4 - 2 4 6 0 4 2	9-2-1992	Japan			Abstract
	JP 6 - 4 0 5 9 1	2-15-1994	Japan			Abstract
	JP 5 - 3 0 6 0 3 7	11-19-1993	Japan			Abstract
	JP 2000-2 8 4 6 0 7	10-13-2000	Japan			Abstract
	JP 2002-1 9 3 4 7 1	7-10-2002	Japan			Abstract
	JP 2003-9 5 4 7 2	4-3-2003	Japan			Abstract

OTHER DOCUMENTS (Including Author, Title, Date, Pertinent Pages, Etc.)

EXAMINER /David Blackshire/	DATE CONSIDERED 04/17/2008
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*EXAMINER: Initial if citation considered, whether or not citation is in conformance with MPEP 609: Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

Notice of References Cited	Application/Control No. 10/532,852	Applicant(s)/Patent Under Reexamination MAKI ET AL.	
	Examiner DAVID A. BLACKSHIRE	Art Unit 2852	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
*	A	US-5,873,016	02-1999	Kurokawa et al.	399/297
*	B	US-2002/0110392	08-2002	Omata et al.	399/303
	C	US-			
	D	US-			
	E	US-			
	F	US-			
	G	US-			
	H	US-			
	I	US-			
	J	US-			
	K	US-			
	L	US-			
	M	US-			

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	Classification
	N	JP 2002060085 A	02-2002	Japan	HAYAKAWA et al.	
*	O	JP 04169440 A	06-1992	Japan	MAKI, TSUNEO	
*	P	JP 2002193471 A	07-2002	Japan	OHATA et al.	
*	Q	JP 05306037 A	11-1993	Japan	KAWAISHI et al.	
	R					
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NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	Ohata et al., JP 2002193471, July 10, 2002, Machine Translation
	V	Kawaishi et al., JP 05306037, November 19, 1993, Machine Translation
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

CLAIMS DETAILED DESCRIPTION TECHNICAL FIELD PRIOR ART EFFECT OF THE INVENTION TECHNICAL PROBLEM MEANS DESCRIPTION OF DRAWINGS DRAWINGS

[Translation done.]

*** NOTICES ***

JPO and INPIT are not responsible for any damages caused by the use of this translation.

1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. **** shows the word which can not be translated.
3. In the drawings, any words are not translated.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

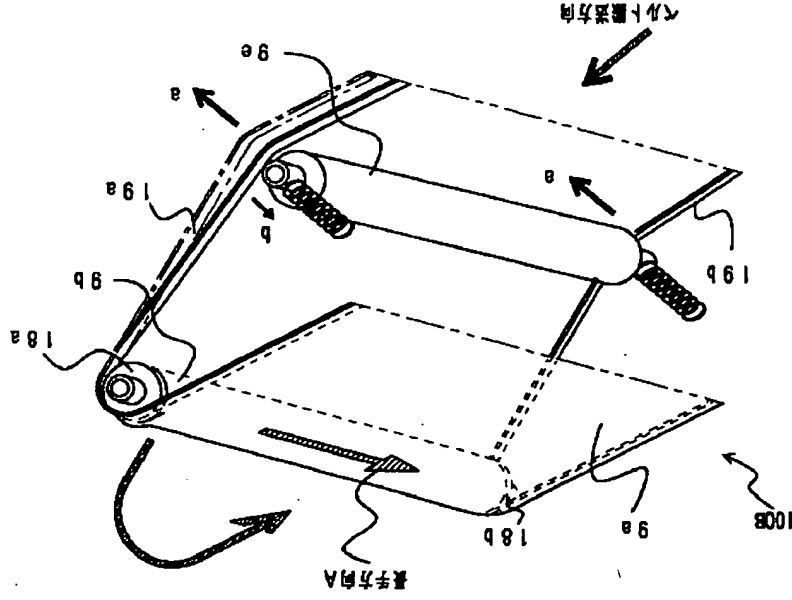
[0001]

[Field of the Invention] When especially this invention drives the endless form belt which conveys a sheet to an image formation part about an image forming device, it controls the deviation to a belt width direction, and it relates to the composition which energizes a belt tension uniformly.

[0002]

[Description of the Prior Art] There are some which adopted an electrophotographing system and electrostatic recording in the conventional image forming device as an image formation process which forms a picture, and as such an image forming device, A cylindrical photoconductive drum is used as image support, and the thing of the form which allocated peripheral equipment, such as an electrifying device, an exposure means, a development counter, and a cleaning machine, a recording material conveyer style (recording material transportation means), etc. in the circumference of this photoconductive drum is known well.

[0003] By the way, in order to aim at much more improvement in functions, such as a photoconductive drum and a recording material conveyer style, the image forming device which adopts the endless belt



[Translation done.]

which is an endless form belt which replaced with the photoconductive drum and uses a photo conductor, or adopts an endless belt as a recording material conveyor style is developed in recent years.

[0004] And if it is in the image forming device which adopted such an endless belt, while becoming possible to aim at improvement in much functions, the means for controlling generating of deviation, meandering, etc. to the reference track of the endless belt at the time of a drive becomes indispensable.

[0005] Although the twist between the members which have stretched the endless belt, etc. are mentioned as a factor of the position shift by deviation movement of an endless belt here, There is a limit in raising accuracy, such as these twists, and when it is made to raise accuracy further, it leads also to the factor which causes the cost hike of the device itself.

[0006] Then, the belt slippage regulation guide 119a provided in the inner skin both ends of the endless belt 109a as it was shown in drawing 8 as a means to amend these, when the deviation of an endless belt and meandering arose conventionally, There are some which were arranged so that the belt slippage regulating members 118a and 118b provided in the side edge part of the follower roller 109b which stretches the endless belt 109a might be made to contact.

[0007] And by making the belt slippage regulation guides 119a and 119b of the endless belt 109a contact the belt slippage regulating members 118a and 118b of the follower roller 9b in this way, When the endless belt 109a rotated, he was trying to regulate the deviation of the endless belt 109a. the belt slippage regulating members 119a and 119b -- the inner skin both ends of the endless belt 109a -- adhesion -- sewing on -- it is joined.

[0008]

[Problem(s) to be Solved by the Invention] However, the follower roller 109b which has regulated the deviation at the time of belt runs in the image forming device of such composition as shown in drawing 2, The endless belt 109a twists, and when an angle is small, the area which the belt slippage regulation guides 119a and 119b and the belt slippage regulating members 118a and 118b contact becomes narrow.

[0009] The tension roller 109e is not arranged at the transportation direction upstream which adjoins the follower roller 109b with which the belt slippage regulating members 118a and 118b were formed as shown in the figure, When the roller which carried out position immobilization other than the tension roller has been arranged, When the contact surface product of endless belts 109a other than the area where the belt slippage regulating members 118a and 118b are in contact with the belt slippage regulation guides 119a and 119b, and a roller increases [near the follower roller 109b which is performing deviation regulation], Bigger power will be needed when regulating the deviation of the endless belt 109a.

[0010] By this between the belt slippage regulation guides 119a and 119b and the belt slippage regulating members 118a and 118b, Big power was added and there was a problem said that the endurance of the belt slippage regulating members 118a and 118b and the belt slippage regulation guides 119a and 119b near the plane of composition of the endless belt 109a and the belt slippage regulation guides 119a and 119b falls rapidly.

[0011] When enlarging tension of the endless belt 109a, or when the rigidity of the endless belt 109a is high, When the slippage power to generate also becomes large, the belt slippage regulation guides 119a and 119b become easy to overcome the belt slippage regulating members 118a and 118b, and, as a result, a run of the

endless belt 109a becomes unstable.

[0012]Belt peripheral length change is carried out by contraction and expansion of the belt by temperature up inside the plane, and deviation occurs at the time of belt runs also according to the imbalance of the belt tension by the phenomenon in which belt tensions differ in an environment, and a right-and-left peripheral length difference peculiar to a belt.

[0013]Then, this invention is made in view of such the actual condition, and it aims at providing the image forming device which prevention of slippage and meandering of an endless belt is aimed at, and can prevent degradation of an endless belt and breakage.

[0014]

[Means for Solving the Problem]This invention an endless form belt which conveys a sheet to an image formation part, and said endless form belt A driving roller, In an image forming device provided with a belt driving means driven while stretching with a tension roller which energizes two or more follower rollers and these endless form belts, It is provided in at least one belt slippage regulation guide formed in a side edge part of inner skin of said endless form belt, and a side edge of said predetermined follower roller, and. At least one belt slippage regulating member which prevents deviation of the cross direction of this endless form belt in contact with said belt slippage regulation guide during rotation of said endless form belt, A predetermined follower roller with which a preparation and said belt slippage regulating member were provided, Said endless form belt of this follower roller twists, and it arranges so that an angle may become the largest in a roller of said belt driving means, said tension roller -- the move direction upstream of an endless form belt of this follower roller -- and it arranges so that said endless form belt may twist and an angle may become the smallest in a roller of said belt driving means

[0015]This invention receives in the direction of 2 bisectrices of an angle of bend of said endless form belt formed in a belt energizing direction of said tension roller with a tangent with a roller of said belt driving means which adjoins this tension roller, It is considered as a direction inclined in said endless form belt conveying direction upstream.

[0016]This invention held both ends of this tension roller for said tension roller independently by an attachment component of an arm method, respectively.

[0017]This invention formed a notch section with an inclined plane in a field which contacts said belt slippage regulation guide of said belt slippage regulating member.

[0018]This invention sets up thickness of said endless form belt, and distance of a follower roller which provided said belt slippage regulating member according to peripheral length, and said tension roller.

[0019]This invention equips with the following a sheet conveying device provided with an endless form belt which conveys a sheet, and a belt driving means driven while stretching said endless form belt with a tension roller which energizes a driving roller, two or more follower rollers, and this endless form belt.

A belt slippage regulation guide formed so that it might project along a hoop direction at the both-sides end of inner skin of said endless form belt.

A belt slippage regulating member which it is provided in a both-sides end of a predetermined follower roller among said two or more follower rollers, and prevents deviation of the cross direction of this endless form belt in contact with said belt slippage regulation guide during rotation of said endless form belt.

A preparation and said tension roller are arranged to the move direction upstream of an endless form belt of

a predetermined follower roller with which it was provided in said belt slippage regulating member, A support means which supports said tension roller so that a shaft direction of said tension roller may incline to a shaft direction of said predetermined follower roller, when said belt slippage regulation guide runs aground to said belt slippage regulating member.

[0020]An endless form belt which conveys a sheet to an image formation part like this invention A driving roller, While driving stretching by a belt driving means provided with a tension roller which energizes two or more follower rollers and endless form belts, form at least one belt slippage regulation guide in a side edge part of inner skin of an endless form belt, and. A belt slippage regulating member which contacts a belt slippage regulation guide is provided in a both-sides end of a predetermined follower roller during rotation of an endless form belt, and deviation of the cross direction of an endless form belt is prevented.

[0021]An endless form belt of a follower roller twists a predetermined follower roller with which a belt slippage regulating member was provided, and it is arranged so that an angle may become the largest in a roller of a belt driving means, A tension roller to the move direction upstream of an endless form belt of a follower roller and by an endless form belt's twisting, and arranging so that an angle may become the smallest in a roller of a belt driving means, When deviation and meandering occur in an endless belt and a belt slippage regulation guide tends to overcome a belt slippage regulating member, it is made for a tension roller to incline and slippage and meandering of an endless belt are canceled.

[0022]

[Embodiment of the Invention]Hereafter, an embodiment of the invention is described using a drawing.

[0023]Drawing 1 is an outline sectional view of the color laser beam printer which is an example of the image forming device concerning a 1st embodiment of this invention.

[0024]In the figure, 100 is a color laser beam printer (henceforth a printer), This printer 100 is provided with the image formation part 100A which has the four scanner units 3a, 3b, 3c, and 3d etc. which comprised the four photoconductive drums 1a, 1b, 1c, and 1d, a rotating polygon, and a reflector.

[0025]To and the four photoconductive drums 1a, 1b, 1c, and 1d in which the surface was uniformly charged by the charged roller 2a, 2b, and 2c and 2d in this image formation part 100A. By irradiating with the light according to picture information by the scanner units 3a, 3b, 3c, and 3d, By forming a latent image in the photoconductive drum surface, respectively, and developing negatives after this by the developing sleeves 4a, 4b, 4c, and 4d in which each latent image was provided by the development counters 7a, 7b, 7c, and 7d, yellow, The visible image of each color of cyanogen, magenta, and black is formed on a photoconductive drum.

[0026]12a, 12b, 12c, and 12d are transfer rollers which weld by pressure to the photoconductive drums 1a, 1b, 1c, and 1d via the endless belt 9a which is an endless form belt mentioned later, and form a transfer section. 6a, 6b, 6c, and 6d are cleaning means.

[0027]On the other hand, in the figure, 13 is a sheet paper cassette which stores the recording material P which is a sheet, the retard roller pair 16 separates into one sheet, and the recording form P stored by this sheet paper cassette 13 is conveyed, after being sent out by the feed roller 18. 14 is a manual feeding part and the recording form by which the manual paper feed was carried out from this manual feeding part 14 is

conveyed by the transportation roller 19.

[0028]9a is an endless belt which is an endless form belt which conveys the recording material P to each transfer section, and after the recording form P conveyed from the sheet paper cassette 13 or the manual feeding part 14 is laid in this endless belt 9a, it is conveyed one by one by each transfer section. [0029]In this embodiment, this endless belt 9a comprises a film shaped member with a thickness of about 150 micrometers which has a rate of volume resistivity below 10^{12} ohm-cm, for example. Here, this volume resistivity is the value which impressed and obtained 100V with the high resistance plan R8340 by ADVANTEST using the measuring probe which carried out the semi- place to the JIS method K6911. [0030]As shown in the figure, this endless belt 9a By the way, the driving roller 9c, The belt slippage regulation follower roller 9b formed in the upstream of the driving roller 9c. It drives being stretched by the belt driving means 100B provided with the follower roller 9d and the tension roller 9e which were formed in the downstream of (it is hereafter called a regulating roller) and the driving roller 9c, and rotates to an arrow direction (counter clockwise).

[0031]These rollers 9b, 9c, 9d, and 9e are held altogether, enabling the free rotation to the bearing provided in the body frame in which each both ends are not illustrated [of the belt driving means 100B], and they are allocated in abbreviated parallel.

[0032]Here, the driving roller 9c comprises a metallic roller which has a rubber layer with a big coefficient of friction on a surface, and the diameter is set as about 30 mm and it rotates it at the rate of predetermined to the arrow direction of the figure by a driving source. The follower roller 9d comprises metallic rollers, such as SUS, for example, and the both-ends bearing part is being fixed to the prescribed position.

[0033]On the other hand, as the regulating roller 9b is shown in drawing 2, in the both ends, the belt

slippage regulating members (henceforth a regulating member) 18a and 18b for regulating faults produced in the endless belt 9a, such as deviation and meandering, are arranged.

[0034]As shown in the figure, here these regulating members 18a and 18b The regulating roller 9b, It is concentrically provided between the bearings which are not illustrated [which support pivotally 9 g of axes of the regulating roller 9b], enabling free rotation, and the inner end face touches the side edge of the regulating roller 9b mostly, and it is mostly molded in the diameter of the same with the regulating roller 9b.

[0035]And when slippage and meandering occur in the endless belt 9a, the regulation guides 19a and 19b provided in the both-sides end of the inner skin of the endless belt 9a come to contact the flank part of these regulating members 18a and 18b (stop).

[0036]The good thing of sliding nature is used like POM desirably [what has a coefficient of friction low as construction material of these regulating members 18a and 18b]. As construction material of the regulation guides 19a and 19b, frictional shearing stress is low and the quality of a rubber material which can also bear the bending stress received when having coiled around each rollers 9b, 9c, 9d, and 9e which are belt **** set-up members is used.

[0037]By the way, as shown in drawing 1, the endless belt 9a twists the regulating roller 9b provided with such regulating members 18a and 18b, and it is arranged so that an angle may become the largest compared with other rollers 9c, 9d, and 9e. And by twisting in this way and making an angle into the maximum, the

contact surface product of the regulating members 18a and 18b and the regulation guides 19a and 19b can be enlarged, and the deviation of the endless belt 9a with big slippage power can be regulated.

[0038]It is always energized in the direction which stretches the endless belt 9a with the spring 9f, and the tension roller 9e is arranged so that the endless belt 9a may twist and an angle may become the smallest compared with other rollers 9b, 9c, and 9d. In this embodiment, the tension roller 9e is arranged in the transportation direction upper stream of the regulating roller 9b.

[0039]This tension roller 9e is held along a belt energizing direction by the attachment component as a support means which is not illustrated [which can be slid] in the slide groove established in the body frame which is not illustrated [of the belt driving means 100B], and here. It is made to energize the endless belt 9a with the helical compression spring 9f as an energizing means.

[0040]And in the belt driving means 100B constituted in this way, if the driving roller 9c rotates to an arrow direction (counterclockwise rotation) by an unillustrated driving source, According to the frictional force of the peripheral face of the driving roller 9c, and the inner skin of the endless belt 9a, driving force is transmitted to the endless belt 9a, and the endless belt 9a rotates between 4 members of the driving roller 9c, the follower roller 9d, the tension roller 9e, and the regulating roller 9b counterclockwise.

[0041]As a result, the recording form P laid in the endless belt 9a after having been conveyed from the sheet paper cassette 13 or the manual feeding part 14. Then, it is conveyed one by one by each transfer section, and the visible image (toner image) of each color of the yellow formed in the photoconductive drum surface, cyanogen, magenta, and black is transferred one by one.

[0042]Permanent fixing of the transferred toner image comes to be carried out by heating and pressurizing after this the recording form P with which the visible image was transferred one by one in this way by the heating roller 21a and the pressurizing roller 21b of the transfer section 21. And the recording form P with which it was fixed to the toner image in this way is discharged by the delivery tray 23 with the paper ejecting roller 22 after this.

[0043]By the way, when conveying the recording form P with the endless belt 9a in this way, slippage and meandering may occur in the endless belt 9a. Next, regulation operation of the regulating members 18a and 18b to slippage and meandering is explained to such an endless belt 9a.

[0044]For example, now, in the rotation process of the endless belt 9a, if the endless belt 9a moves to the longitudinal direction A of the regulating roller 9b as shown in drawing 3, the regulation guide 19a provided in the endless belt 9a will contact the regulating member 18a of the regulating roller 9b, and will be regulated. Since the length of the cross direction of the rollers 9c, 9d, and 9e which are belt **** set-up members other than a slippage regulating roller at this time is shorter than the regulating roller 9b, the regulation guide 19a does not contact.

[0045]By the way, when the tension of the endless belt 9a was set up greatly, or when rigidity is high, the power of the longitudinal direction A concerning the regulating roller 9b and what is called slippage power tend to become large, the regulation guide 19a tends to come together, and it is going to overcome the regulating member 18a.

[0046]And if the regulation guide 19a tends to overcome the regulating member 18a in this way, The belt peripheral length of the side which is going to overcome the endless belt 9a A part for the thickness of the

regulation guide 19a, The tension of the endless belt of the side which is going to become short and it is going to overcome as a result becomes strong, and tension becomes out of balance crosswise, It is a roller with which the regulating roller 9b adjoins each other, and with an energizing direction, the tension roller 9e arranged in the transportation direction upper stream is stuffed into a counter direction (direction which separates from an endless belt), and inclines greatly to other stretching rollers 9b, 9c, and 9d.

[0047]In this embodiment, this tension roller 9e, comparing with other stretching rollers 9b, 9c, and 9d -- a belt volume -- the price -- since it is arranged so that an angle may become the smallest, with an energizing direction, it is pushed into a counter direction and comes to incline with a sufficient response greatly to other stretching rollers 9b, 9c, and 9d.

[0048]If the tension roller 9e inclines in this way, the spring force of the compression spring 9f will act on the tension roller 9e here, It acts in the direction in which the tension roller 9e cancels the deviation of the endless belt 9a according to this spring force, the regulation guide 19a which was going to run around by this comes to return to a regular guide position, and it can prevent the regulation guide 19a overcoming the regulating member 18a.

[0049]By the way, when the regulating roller 9b twists, the tension roller 9e twists when an angle is not large, and an angle is large, Or in the case where the tension roller 9e is not arranged to the transportation direction upstream which the regulating roller 9b adjoins, the inclination of only the tension roller 9e which makes the deviation of the endless belt 9a cancel is not obtained.

[0050]For this reason, once the regulation guides 19a and 19b tend to come together and it is going to overcome the regulating members 18a and 18b, it would be immediately connected with wear of the regulation guides 19a and 19b, peeling, a gap, and riding ***** , and the fracture of the endless belt 9a will be caused.

[0051]however, this embodiment -- like -- the endless-belt volume of the regulating roller 9b -- the price -- the maximum in a stretching roller twisting an angle and considering it as an angle -- the belt volume of the tension roller 9e -- the price -- it being cheap and by carrying out the minimum of the angle, And it becomes possible to regulate the deviation of the endless belt 9a which had big slippage power with easy composition, and degradation of the endless belt 9e and breakage can be prevented.

[0052]the endless-belt volume of this regulating roller 9b -- the price -- since the contact surface product of the regulating members 18a and 18b and the regulation guides 19a and 19b becomes larger as an angle is large, slippage of the endless belt 9a can be made to cancel more certainly

[0053]a regulating roller belt volume -- the price -- the relation of an angle, and a drive - the deviation permission roller parallelism of a follower roller becomes as it is shown in the following tables.

[0054]

[Table 1]

規制ローラーの巻取り角	駆動～従動ローラーの片寄り許容ローラー平行度
60°	0.43°
90°	0.65°
120°	0.92°

[0055]and clear from this table -- as -- a regulating roller belt volume -- the price -- as an angle is enlarged, even if it is not the drive of high accuracy - the deviation permission roller parallelism of a follower roller, generating of the deviation of the endless belt 9a can be prevented, and an assembly of the belt driving means 100B etc. become easier.

[0056]it is shown in drawing 9 mentioned already, for example -- as -- the endless-belt volume of the regulating roller 9b -- the price, when the maximum in a stretching roller twists and the angle does not have an angle, When the regulation guides 19a and 19b run aground, the degree to which peripheral length becomes short becomes small, and the inclination of only the tension roller 9e which makes the deviation of the endless belt 9a cancel cannot be secured.

[0057]however, it mentioned already -- as -- the belt volume of the regulating roller 9b -- the price -- the more, the more an angle is large, The peripheral length rate of change at the time of the regulation guides 19a and 19b running aground becomes large, as a result, the tension roller 9e comes to incline greatly, and the deviation of the endless belt 9a can be made to cancel more certainly.

[0058]on the other hand -- the endless-belt volume of the tension roller 9e -- the price -- if the minimum in a stretching roller twists and the angle does not have an angle, according to change of peripheral length, only the inclination which makes slippage of the endless belt 9a cancel is not securable. In other words, it twists, and the more an angle is small, a roller position changes a lot to change of the peripheral length of the endless belt 9a, and, the more the tension roller 9e inclines in the direction b which cancels slippage (refer to drawing 3).

[0059]the regulating roller belt volume from the above thing -- the price -- another angle > and stretching roller belt volume -- the price -- an angle > tension roller belt volume -- the price -- by arranging the regulating roller 9b and the tension roller 9e so that a relation called an angle may be realized, Slippage of the endless belt 9a can be made to cancel certainly.

[0060]The tension roller 9e in the transportation direction upper stream of the regulating roller 9b by and the thing to arrange in an adjacent position. It turned out in the experiment that the reaction force on which the belt restricting guides 19a and 19b force the regulating members 18a and 18b, and the effect of the synergistic effect of inclination by endless-belt peripheral length change of the tension roller 9e occurring, and making the deviation of the endless belt 9a canceling appear notably.

[0061]On the other hand, this effect's arrangement of the roller by which position immobilization was carried out instead of the tension roller 9e will decrease it greatly like the following data.

[0062]This data uses the belt driving apparatus of this embodiment shown in drawing 1, and the belt

driving apparatus which arranged the roller fixed to the tension roller position shown in the figure, It is an experimental result about the ability of a regulation guide to regulate [to the parallelism of which] by breaking down the parallelism of a driving roller and a regulating roller intentionally.

[0063]As a result, the belt deviation permission roller parallelism of a driving roller - a regulating roller is a tension roller. : Not less than (not experimented in the parallelism beyond this on device relations) 2.6 degrees

The roller which carried out position immobilization: It became 0.9 degree.

[0064]namely, the tension roller 9e -- the transportation direction upper stream of the regulating roller 9b -- and when making it arrange in an adjacent position, even if it was not the drive of high accuracy - the deviation permission roller parallelism of the follower roller, it became clear that generating of the deviation of the endless belt 9a can be prevented.

[0065]When it was the value which changed the belt energizing load C to the belt plane direction load B as shown in drawing 4, and broke the belt tension by endless-belt width length, as for this phenomenon, it was checked visually that a belt tension demonstrates a greatest effect in the state of 0.14N/mm or less.

[0066]It receives in the direction of the 2 bisectrices L of the angle of bend of the endless belt 9a formed in the belt energizing direction of the tension roller 9e in this embodiment with the stretching roller (the regulating roller 9b and the follower roller 9d) which adjoins the tension roller 9e as shown in the figure, It has set up in the direction inclined in the direction-of-movement upstream of an endless form belt. And it is possible by constituting in this way to lean inclination of the tension roller 9e by an endless-belt right-and-left peripheral length difference in the direction which cancels belt slippage.

[0067]When comparative experiments were conducted also about the endurance of a belt driving apparatus, as for the conventional belt driving apparatus, breakage of the belt occurred in about 168 hours to the ability of the belt driving apparatus of this embodiment to have obtained the run stable for 300 hours or more.

[0068]In the thickness of a substrate, 50-200 micrometers and peripheral length to the endless belt 9a Not less than 300 mm, By taking the distance between pitches of the regulating roller 9b and the tension roller 9e not less than 50 mm, as shown in drawing 5 when a belt of 1000 mm or less is used, It turned out that the effect which cancels slippage of the endless belt 9a increases, without making high accuracy of belt deviation permission roller parallelism.

[0069]As stated above, according to this embodiment, slippage and meandering of the endless belt 9a can be prevented, and high-durability-izing of an endless belt and the stable performance traverse can be obtained.

[0070]By the way, although the slide of the attachment component which holds the tension roller 9e in old explanation only to a belt energizing direction is enabled and being stated taking the case of the case where the helical compression spring 9f performs belt energization via the tension roller 9e, This invention may use the attachment component of the arm method of single-sided independence as an attachment component for holding not only this but the tension roller 9e.

[0071]Drawing 6 is an outline sectional view of the color laser beam printer which is an example of the image forming device concerning a 2nd embodiment of such this invention. In the figure, drawing 1 and

identical codes show the same or a considerable portion.

[0072]In the figure, 13B is the tension roller 9e an arm type attachment component to hold, and this arm type attachment component 13B, The tension roller 9e is moved by making the axis 13A into a fulcrum to the attachment component of a 1st embodiment mentioned already moving the tension roller 9e by contact surface sliding.

[0073]And by moving the tension roller 9e by making the axis 13A into a fulcrum in this way the arm type attachment component 13B, It becomes still more possible than the attachment component of a sliding type to lean the tension roller 9e with a sufficient response to the peripheral length change by the deviation of the regulation guides 19a and 19b, and it becomes possible to enlarge an effect more.

[0074]By the way, although it is mostly molded in the diameter of the same with both the regulating rollers 9b and the example was shown [the inner end face the outside end surface, and j, until now the shape of the regulating members 18a and 18b, An inner end face may use the regulating roller 9b and the member from which the outside end surface part is mostly molded by tapered shape in the outer diameter smaller than the path of the regulating roller 9b by the diameter of the same again.

[0075](a) of drawing 7 and (b) are the figures showing the composition of such a regulating member 18A, and, as for the inner end face of this regulating member 18A, the notch sections 18c and 18d are mostly formed in the end of an outside end surface part with the regulating roller 9b again at the diameter of the same. Although a graphic display is not carried out, the regulating member 18A of the same composition also as the other end of the regulating roller 9b is formed.

[0076]And by forming such a notch section 18d, the endless belt 9a generates deviation at the time of a run, and change of the peripheral length at the time of the belt restricting guides 19a and 19b overcoming the regulating member 18A becomes loose. As a result, it becomes possible to reduce wear of the regulation guides 19a and 19b compared with an inner end face, an outside end surface, and both the regulating rollers 9b and the thing currently mostly molded in the diameter of the same.

[0077]

[Effect of the Invention]As explained above, according to this invention. while making the endless form belt volume price angle of the predetermined follower roller with which the belt slippage regulating member was provided become the largest in the roller of a belt driving means -- the endless form belt volume of a tension roller -- the price -- an angle by making it become the smallest in the roller of a belt driving means, When a belt slippage regulation guide tends to overcome a belt slippage regulating member, it can prevent a tension roller coming to incline mechanically in the direction which cancels slippage and meandering of a belt, and a slippage regulation guide member coming together, and overcoming a regulating member. Thereby, prevention of slippage and meandering of an endless belt can be aimed at, and degradation of an endless belt and breakage can be prevented.

[Translation done.]

JAPANESE

[JP,05-306037,A]

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FIELD PRIOR ART EFFECT OF THE INVENTION
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EXAMPLE DESCRIPTION OF DRAWINGS DRAWINGS

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates to the belt driving apparatus of the endless belt which impresses tension to two or more rollers which support a toner image or a transfer paper and are conveyed to a next process field, and passes by anchoring at the ends through and rotates it on them.

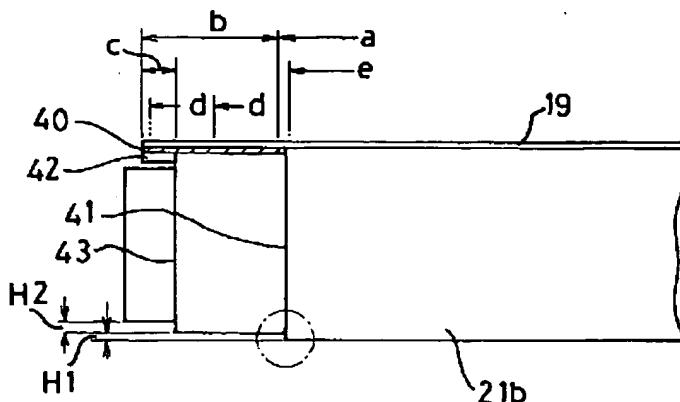
[0002]

[Description of the Prior Art] The belt driving apparatus of the above-mentioned form is common knowledge.

It is used for the photo conductor belt of an image forming device, the transfer belt of the color image forming device, etc.

In this kind of image forming device, a rubber system, a resin film system, a metal system, etc. are mentioned as a belt material. With the color image forming device, a resin film system with high electrical resistance with little elongation is widely used for a transfer belt etc., with the usual monochrome copying machine, the thing of a rubber system is used for many years, and the thing of a metal

Drawing selection Representative draw



[Translation done.]

system is used, for the photo conductor belt etc.

[0003] If slippage arises, in order for a picture gap etc. to arise and to degrade imaging quality, such a belt is constituted so that a belt slippage regulating member may be provided in the end of a belt and belt slippage may be prevented. However, when a belt slippage regulating member is provided, in the case of the thing of a resin film system, an end crack may be especially produced by stress concentrating near [the] the regulating member etc.

[0004] So, to JP,2-95070,U, as shown in drawing 6, lengthening time to an end crack development is indicated by sticking the reinforcing member 51 on the end of the belt 50.

[0005]

[Problem(s) to be Solved by the Invention] However, attachment of the reinforcing member 51 will produce the level difference 52 on the belt 50. And in the case of the belt which the belt 50 of polycarbonate resin is hard and cannot be extended easily, there was a problem that an end crack will occur for a short time in a little level difference like the level difference 52, edge or a barricade of a roller corner, etc.

[0006] As shown in drawing 7, when the slippage power of the belt was large, there was also a possibility that the belt slippage regulating member 54 might run the roller 53 aground, and might lead to breakage.

[0007] This invention solves the above-mentioned conventional problem, suppresses a belt crack, prolongs a life, and sets it as the providing-belt driving apparatus which moreover prevented flapping and whose performance traverse was stable purpose.

[0008]

[Means for Solving the Problem] To achieve the above objects, in a belt driving apparatus of an endless belt which impresses tension to two or more rollers which this invention supports a toner image or a transfer paper, and are conveyed to a next process field, and passes by anchoring at the ends through and rotates it on them, A reinforcing member is stuck on an end of said endless belt, and the 1st level difference from which a reinforcing member contact range serves as a byway rather than a center region is provided in said roller.

[0009] This invention is formed in roundness whose rectangular shape of said 1st level difference the depth of said 1st level difference is more than thickness of said reinforcing member, and is about 0.05-0.3 mm in radius.

[0010] This invention established a cleaning means which cleans the surface of said endless belt, and cleaning width of this cleaning means has reached in said reinforcing member contact range further again.

[0011]As for this invention, a belt slippage regulating member is stuck on an end of said endless belt, and the 2nd level difference from which a belt slippage regulating member contact range serves as a byway rather than said 1st level difference is provided in said roller further again.

[0012]This invention is formed in roundness whose rectangular shape of said 2nd level difference the depth of said 2nd level difference is more than thickness of said belt slippage regulating member, and is about 0.05-0.3 mm in radius further again.

[0013]This invention is characterized by a wide thing further again in order of said toner image or the maximum image width of a transfer paper, a center region of said endless belt, cleaning width of said cleaning means, Sepang in said belt slippage regulating member contact range, said endless-belt width, and said roller width.

[0014]This invention has a braid with which said cleaning means ****s to said endless belt, and this blade beam set it up further again more widely than Sepang in said belt slippage regulating member contact range.

[0015]

[Function]By the above-mentioned composition, a toner image and a transfer paper are supported with the belt driving apparatus indicated in the example, there is no generating of transfer position gap according endless belts, such as an intermediate transfer belt conveyed to the following process, to the elasticity or curl ****, and the endless belt which was excellent in endurance can be obtained.

[0016]

[Example]Hereafter, the example of this invention is described according to an accompanying drawing. The outline lineblock diagram of the color copying device with which the belt driving apparatus which drawing 1 requires for this invention is applied, and drawing 2 are the enlarged drawings of the circumference of a photo conductor and an intermediate transfer belt. Below, the composition and operation of a color copying device are explained.

[0017]The color image reader (a color scanner is called hereafter) 1, Image formation of the picture of the manuscript 3 is carried out to the color sensor 7 via the lighting lamp 4, the mirror group 5, and the lens 6, and the color image information of a manuscript is read, for example for every color separation light of Blue (it abbreviates to B), Green (it abbreviates to G), and Red (it abbreviates to R), and is changed into an electric picture signal. And it is a deed about a color conversion process at an image processing portion (with no graphic display) based on the color separation picture signal intensity level of B, G, and R obtained with this color scanner 1. The color image

data of Black (it is hereafter described as Bk), Cyan (**, C), Magenta (**, M), and Yellow (**, Y) is obtained.

[0018]With the color image recorder (a color printer is called hereafter) 2 which describes this below, development of Bk, C, M, and Y is performed, this is piled up, and 4 color full color image is formed.

[0019]Next, the outline of the color printer 2 is explained. The writing light study unit 8 changes the color image data from the color scanner 1 into a lightwave signal, performs the optical writing corresponding to a manuscript picture, and forms an electrostatic latent image in the photo conductor drum 9 as latent image support.

[0020]Although the photo conductor drum 9 rotates counterclockwise like an arrow, Around it, as the photo conductor cleaning unit (the charge neutralizer before cleaning is included) 10, the electric discharge lamp 11, the electrifying device 12, the potential sensor 13, the Bk development counter 14, the C development counter 15, the M development counter 16, the Y development counter 17, the developing density pattern detector 18, and support.

***** 19 etc. are arranged. The developing sleeves 14a, 15a, 16a, and 17a rotated so that a developer may be made to counter the photo conductor 9 in order that each development counter may carry out the manuscript of the electrostatic latent image. It comprises the development paddles 14b, 15b, 16b, and 17b which rotate in order to pump up and stir a developer, the toner concentration detecting sensors 14c, 15c, 16c, and 17c of the developer, etc. The example of Bk, C, M, and Y explains an order (color-image-formation order) of developing operation below. However, image formation order is not limited to this.

[0021]When copy operation is started, it is the color scanner 1. Reading of Bk image data starts from the time of being predetermined timing, and the optical writing and latent image formation by a laser beam start based on this image data (the electrostatic latent image by Bk image data is hereafter called Bk latent image.). The same may be said of C, M, and the Y. That development should be made possible from the tip part of this Bk latent image, before a latent image tip part arrives at the developing position of the Bk development counter 14, the rotation start of the developing sleeve 14a is carried out, and Bk latent image is developed with Bk toner. And although the developing operation of Bk latent image area is continued henceforth, when Bk latent image rear end part passes through Bk developing position, it changes into a development non-operative state. This is made to complete at least before C latent image tip part by the following C image data reaches.

[0022]Bk toner image formed in the photo conductor 9 is

transferred on the surface of the intermediate transfer belt 19 by which the uniform drive is carried out to the photo conductor (the toner image transfer to an intermediate transfer belt from a photo conductor is hereafter called belt transfer). Belt transfer is performed because the photo conductor 9 and the intermediate transfer belt 19 impress predetermined bias voltage to the transfer bias roller 20 in a contact state. Alignment of the toner image of Bk, C, M, and Y which are formed in the photo conductor 9 one by one is carried out to the intermediate transfer belt 19 one by one in the same side, 4 ***** belt transfer picture is formed, and package transfer is performed to a transfer paper after that. The composition and operation of this intermediate transfer belt unit are mentioned later.

[0023]In the photo conductor 9, although it progresses to C process after Bk process, C image data reading by the color scanner 1 begins from predetermined timing, and the laser beam writing by the image data performs C latent image formation.

[0024]After previous Bk latent image rear end part passed, and before the tip of C latent image reaches to the developing position, the C development counter 15 carries out the rotation start of the developing sleeve 15a, and develops C latent image with C toner. Although the development of C latent image area is continued henceforth, when a latent image rear end part passes, it changes into a development non-operative state like the case of previous Bk development counter. This is also made to complete before the following M latent image tip part reaches too. About the process of M and Y, since operation of each image data reading, and latent image formation and development is the same as that of the process of above-mentioned Bk-C, explanation is omitted.

[0025]Next, an intermediate transfer belt unit is explained. The intermediate transfer belt 19 is almost wound around the driving roller 21, the belt transfer bias roller 20, the follower roller 21a, and the cleaning counter roller 21b, and is given tension.

Drive controlling is carried out like the after-mentioned by the drive motor which is not illustrated.

[0026]The belt cleaning unit 22 comprises the brush roller 22a, the rubber braid 22b, the attachment-and-detachment mechanism 22c from a belt, etc.

While carrying out belt transfer of the 2nd color after carrying out belt transfer of the BK picture of one amorous glance, the 3rd color, and the 4th amorous glance, the paper transfer unit 23 is constituted from the paper transfer bias roller 23a, the roller cleaning blade 23b, the attachment-and-detachment mechanism 23c from a belt, etc. by the

attachment-and-detachment mechanism 22c.

Although the bias roller 23a is usually estranged from the field of the intermediate transfer belt 19, When carrying out package transfer of the heavy picture of four colors formed in the field of the intermediate transfer belt 19 to a transfer paper, take timing and it is pressed by the attachment-and-detachment mechanism 23c, The 9th page of the photo conductor which impressed predetermined bias voltage to the paper transfer bias roller 23a, and performed transfer to paper, or was simultaneously charged by the electrifying device 12 is made to contact, and transfer to paper is performed.

[0027]According to the timing to which the tip part of 4 color pile pictures of an intermediate transfer belt side arrives at a paper transfer position, paper is fed to the transfer paper 24 by the feed roller 25 and the resist roller 26.

[0028]although how to move the intermediate transfer belt 19 can consider the following three kinds as an operation method after belt transfer of Bk toner image of one amorous glance is completed to a rear end part -- one method in this -- or according to copy size, it operates with the combination of an efficient method (copy speed side etc.).

[0029]1) After belt transfer of a 1 constant-speed forward movement method 1.Bk toner image continues forward movement by fixed Hayashi as it is.

2. And when Bk picture tip position on the field of the intermediate transfer belt 19 arrives at the belt transfer position of a contact portion with the photo conductor 9 again, timing is taken and image formation of the photo conductor 9 side is carried out so that the tip part of the following C toner image may come to the position exactly. As a result, alignment of the C picture is correctly carried out to Bk picture, and belt transfer is carried out in piles on the intermediate transfer belt 19.

3. After that, similarly, by operation, progress to M and Y picture process and obtain the belt transfer picture of 4 color piles.

Moving forwardly as it is following on Y toner image belt transfer process of 4.4 amorous glance, as described above, package transfer of the 4 color pile toner image on an intermediate transfer belt side is carried out to the transfer paper 24.

[0030]2) If belt transfer of a skip forward movement method 1.Bk toner image is completed, make the belt 19 estrange from the field of the photo conductor 9, and a forwardly moving direction as it is is made to carry out a high speed skip, and if the specified quantity is moved, it will return to the original forward movement speed. As a result, the intermediate transfer belt 19 is again contacted to the photo

conductor 9.

2. And when Bk picture tip position on the field of the intermediate transfer belt 19 arrives at a belt transfer position again, timing is taken and image formation of the photo conductor 9 side is carried out so that the tip part of the following C toner image may come to the position exactly. As a result, alignment of the C picture is correctly carried out to Bk picture, and belt transfer is carried out in piles.

3. After that, similarly, by operation, progress to M and Y picture process and obtain the belt transfer picture of 4 color piles.

Following on Y toner image belt transfer process of 4.4 amorous glance, package transfer of the 4 color pile toner image on the 19th page of a belt is carried out to the transfer paper 24 at a forward movement speed as it is.

[0031]3) Make an opposite direction carry out a high-speed return, if belt transfer of a reciprocation (quick return) method 1. Bk toner image is completed at the same time it makes the belt 19 estrange from the field of the photo conductor 9 and stops forward movement.

[0032]Bk picture tip position on the field of the belt 19 passes a belt transfer equivalent position to an opposite direction, after moving a part for the distance set up further beforehand, it is made to stop, and a return is made into a waiting state.

[0033]2. When the tip part of near C toner image of the photo conductor 9 next arrives at a front prescribed position from a belt transfer position, make a forwardly moving direction start the intermediate transfer belt 19 again. The belt 19 is again contacted to the field of the photo conductor 9.

[0034]Also in this case, C picture is controlled by conditions which lap with Bk picture correctly on the field of the belt 19, and belt transfer is carried out.

[0035]3. After that, similarly, by operation, progress to M and Y picture process and obtain the belt transfer picture of 4 color piles.

[0036]Following on the belt transfer process of Y toner image of 4.4 amorous glance, it moves forwardly at a speed as it is, without carrying out a return, and package transfer of the 4 color pile toner image on the 19th page of a belt is carried out to the transfer paper 24.

[0037]The transfer paper 24 by which package transfer was carried out in 4 color pile toner image from the intermediate transfer belt side is conveyed by the fixing assembly 28 with the paper carrying unit 27, carries out melting fixing of the toner image with the fixing roller 28a and the pressurizing roller 28b which were controlled by prescribed temperature, is taken out by the copy tray 29, and obtains a full color

copy.

[0038]The intermediate transfer belt 19 after transferring a toner image to the transfer paper 24 presses the cleaning unit 22 by the attachment-and-detachment mechanism 22c again, is contacted to the field of the photo conductor 9 which cleaned the surface or was simultaneously charged by the electrifying device 12, and cleans the surface by the cleaning unit 22.

[0039]By the photo conductor cleaning unit 10, the photo conductor 9 after belt transfer has the surface cleaned, and is uniformly discharged with the electric discharge lamp 11 again.

[0040]The intermediate transfer belt 19 after transferring a toner image to the transfer paper 24 presses the cleaning unit 22 by the attachment-and-detachment mechanism 22c again, is contacted to the 9th page of the photo conductor simultaneously electrified by the electrifying device 12, and cleans the surface by the cleaning unit 22.

[0041]At the time of a repeat copy, operation of the color scanner 1 and the image formation to the photo conductor 9 progress to Bk (one amorous glance) picture process of the 2nd sheet to predetermined timing following on Y (four amorous glance) picture process of the 1st sheet.

[0042]The belt transfer of the Bk toner image of the 2nd sheet is made to carry out the direction of the intermediate transfer belt 19 to the field cleaned by the cleaning unit 22 in the surface following on the package transfer process to the transfer paper of 4 color pile pictures of the 1st sheet. After that, it is operating like the 1st sheet.

[0043]The transfer paper of various sizes is stored by the transfer paper cassettes 30, 31, 32, and 33, and timing is taken from the storage cassette of the size paper specified with the navigational panel (with no graphic display), and it is fed [paper] and conveyed in the direction of the resist roller 26. The manual paper feed tray 34 can also be formed for an OHP sheet, pasteboard, etc.

[0044]Although the above was explanation of the copy mode which obtains 4 color FURUKARA, in the case of 3 color copy mode and 2 color copy mode, the operation same about the part of the specified color and the number of times as the above will be performed. In the case of monochrome copy mode, make it into a development operating state until a specified number is completed, and only the development counter of the color the intermediate transfer belt 19, Copy operation is performed in the state where 1 constant speed drive is carried out to a forwardly moving direction, with the 9th page of a photo conductor contacted, and the belt cleaner 22 has also contacted the intermediate transfer belt 19 further.

[0045]Drawing 3 shows the partial expanded sectional view

of the above-mentioned intermediate transfer belt 19 and the cleaning counter roller 21b. The reinforcing member 40 is stuck on at least one end of the intermediate transfer belt 19 in drawing 3. Although the adhesive tape which used polyester film as the base is common as this reinforcing member 40, it is not this limitation and the reinforcing member 40 needs to choose from a belt material the thing of the high construction material of especially flexibility which has a high mechanical strength. If the thickness of the reinforcing member 40 has a 25-200-micrometer effective thing and it is too thick, the rigidity of a belt will become high too much, and the path of the roller rolled especially almost may cause belt flapping and wrinkles in the large place of a contact angle in a byway.

[0046]By the way, the intermediate transfer belt 19 is made from polycarbonate resin, In the case of the hard and easily unextended belts, such as polycarbonate resin, it explained previously that there was a problem that an end crack will occur in edge or a barricade of the level difference of a little belt and a roller corner, etc. for a short time.

[0047]So, in this invention, the 1st level difference 41 from which the contact range b of the reinforcing member 40 becomes the cleaning counter roller 21b with a byway from the center region a is formed. This level difference 41 is formed in the height H1 more than the thickness of the reinforcing member 40. Since a stripe-like crack goes into the intermediate transfer belt 19 in the edge of the corner 41a, and a barricade at the level difference 41 and the life is shortened, as shown in drawing 4, roundness about 0.05-0.3 mm in radius is attached, and the shape of the corner 41a is formed.

[0048]Even if the reinforcing member 40 is stuck and a level difference arises on the intermediate transfer belt 19 in this way, by having formed the 1st level difference 41 in the cleaning counter roller 21b, the level difference on the intermediate transfer belt 19 is canceled, and an end crack can be prevented from occurring in the intermediate transfer belt 19 for a short time. In the conventional example shown in drawing 6, if the reinforcing member 51 is stuck on the belt 50, the air layer part shown with the numerals 55 will be made. Since the contact angle of a cleaning blade affects cleaning nature greatly at this time as the roller 53 is a cleaning counter roller, The contact tolerance level of a cleaning blade becomes a central site rather than the air layer part 55, a belt roller support unit becomes large, and a problem arises on a space and cost. Since stress concentration will be carried out to the neighborhood if the air layer part 55 is made, it is easy to produce an end crack. In this invention, since an air layer part is not made, it is hard to produce an end crack, and even if the contact

tolerance level of a cleaning blade is in the contact range b of the reinforcing member 40 further, it does not interfere. However, since the contact pressure of a braid will become weak if the difference of the height H1 of the level difference 40 and the thickness of the reinforcing member 40 is too large, the range of 0 thru/or 0.05 mm is preferred for the difference of the height H1 of the level difference 40, and the thickness of the reinforcing member 40. However, when cleaning nature has a margin, the above-mentioned difference is good as for ± 0.02 mm etc.

[0049]In this example, the belt slippage regulating member 42 is stuck on the end of the intermediate transfer belt 19, and the 2nd level difference 43 from which the contact range c of the belt slippage regulating member 42 serves as a byway rather than the roller diameter of the 1st level difference 41 is formed in the cleaning counter roller 21b. This level difference 43 is formed in the height H2 more than the thickness of the belt slippage regulating member 42, and the shape of the corner of the level difference 43 also attaches roundness about 0.05-0.3 mm in radius, and it is formed.

[0050]the crack development of a belt [as opposed to reinforcing member width in drawing 5] -- it is a graph showing time until it carries out, and since the usual belts are replacement parts, if there is not less than 10 mm, it will be satisfactory practically. Crack development time can be further lengthened by sticking also on the surface side of the intermediate transfer belt 19.

[0051]In the intermediate transfer belt 19, if e and cleaning width of a cleaning blade are set to d, the maximum image width of a transfer paper, If width sets up widely in order of inner Sepang of the contact range c of the maximum image width e, the center region a, the cleaning width d, and the belt slippage regulating member 42, inclination of the belt slippage regulating member 42 when belt slippage is large is made small, and a belt life can be raised. If cleaning width is made into d' and it sets up in the contact range c of the belt slippage regulating member 42, the belt slippage regulating member 42 can be prevented from running aground on a roller by a cleaning blade. It is possible to prevent this riding raising by coming together and making Praed width larger than regulating member width. In the former, since such a separate member is [**** crack ***** which provides a separate member, rides and prevents a raising] unnecessary, space-saving and part reduction (cost cut) are possible.

[0052]As for a roller, although the roller which attaches a level difference was explained for the cleaning counter roller 21b, it is preferred to constitute similarly about the driving roller 21, the belt transfer bias roller 20, and the follower roller 21a.

[0053]

[Effect of the Invention]According to this invention, like the above, the stability and the belt of transfer by equalization of a belt life rise and transfer pressure, and stabilization of the belt runs by driving roller adhesion power rise can be attained by preventing flapping of a belt surface and making it smooth. Belt width, roller length, and a supporter are made into necessary minimum, and space-saving, weight reduction, and cost reduction can be planned.

[Translation done.]

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ABSTRACT:

PROBLEM TO BE SOLVED: To provide an inexpensive belt drive device capable of stably and rotatingly moving a belt without causing a looseness and wrinkles thereon and without riding of a guide member on the guide part of a roller, and an image forming device using the belt drive device.

SOLUTION: The compression lengths of a pair of pressuring

springs 83 and 93 are set so that the requirement of the relationship
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